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28 May 02
R. Talbot

In the United States Patent and Trademark Office

Serial No. _____

Appn. Filed : _____

Inventors: Igor Gurevich, Viktor Faibishenko, Nikolai Fedyakin, Shinkyo Kaku, Leonid Velikov

Applicant:

Appn. Title: OPTICAL MODULE FOR HIGH-SPEED BIDIRECTIONAL TRANSCEIVER

Examiner/GAU: _____

Mailed:

At:

Information Disclosure Statement

Assistant Commissioner for Patents

Washington, District of Columbia 20231

Sir:

Attached is a completed Form PTO-1449 and copies of the pertinent parts of the references cited thereon. Following are comments on references pursuant to Rule 98:

U.S. Pat. No. 4,592,619 issued to E. Weidel on Jun. 3, 1986 discloses an optical coupling element utilizing a variety of microoptic elements with spherical and plane surfaces for collimating, focusing and redirecting transmitted/received light waves. The Weidel arrangement utilizes at least one optical element, which must be traversed twice by a received light signal. This device is necessarily limited to providing coupling between both a transmitter and receiver to an optical fiber. However, there exist situations wherein a pair of transmitters, operating at different wavelengths, must be coupled over the same fiber (unidirectional transmitter).

U.S. Pat. No. 4,904,043 issued in 1990 to R. Schweizer describes a device in which dual wavelength coupling is achieved utilizing a set of three lenses and a dichroic filter, all held in a precision die-cast housing with the active devices. In one embodiment, the coupler may be used as a bidirectional transceiving device. A main disadvantage of the device disclosed in U.S. Patent No. 4,904,043 consists in that a photoreceiver should always be optically coaxial with an optical axis of one of two light sources that generate light of a working wavelength λ_1 or λ_2. Such a design is inconvenient for suppression of crosstalk, e.g., a parasitic signal with the wavelength λ_2 when a photodiode receives a useful signal with wavelength λ_1.

U.S. Patent No. 5,485,538 issued on January 16, 1996 to T. Bowen et al. discloses a typical bidirectional transceiver with orthogonal arrangement of two light beams with wavelength λ_1 and λ_2. One disadvantage of the transceiver of U.S. Patent No. 5,485,538 consists in that all optical elements, including HOE, used for beam management transform the beams into converging or diverging beams. This creates significant problems for alignment of the beams because all the optical elements must be adjusted simultaneously. Another disadvantage, which is inherent in all orthogonal bidirectional transceivers, consists in that their geometry is unsuitable for use in conjunction with high-speed controllers.

U.S. Patent No. 5,487, 124 issued on January 23, 1996 to the same applicants as the previous patent describes a bidirectional transceiver that differs from the one described in U.S. Patent No. 5,485,538 by the fact that the HOE is replaced by a GREEN lens. Therefore the device of this patent entails all disadvantages of the previously described design, including speed limitations due to geometry.

U.S. Patent No. 5,621,573 issued on April 15, 1997 to W. Lewis, et al. describes a bidirectional link that allows sequential or simultaneous transmission and reception of optical signals using conventional components. Although this device

partially simplifies the alignment procedure due to the use of preassembled units, the limitations by speed remain unsolved due to the use of practically the same geometry as in all previously known orthogonal arrangement.

U.S. Patent No. 5,796,899 issued to T. Butrie et al. on August 18, 1998 describes an optical transceiver assembly for use in a bidirectional system that includes a beam splitter to direct an incoming signal to a photodiode. An outgoing signal from a laser diode is partially transmitted and partially reflected by the splitter. The reflected signal, which may reach the photodiode, constitutes crosstalk which is reduced by means of a cavity positioned to receive the reflected signal and an oblique surface within the cavity adapted to prevent much of the reflected signal from reaching the photodiode. U.S. Patent No. 5,838,859 issued on November 17, 1998 to the same applicants as in U.S. Patent No. 5,796,899 describes an optical transceiver assembly for use in a bidirectional system that includes a beam splitter to direct an incoming signal to a photodiode. An outgoing signal from a laser diode is partially transmitted and partially reflected by the splitter. The reflected signal, which may reach the photodiode, constitutes crosstalk, which is reduced by orienting the polarization direction of the splitter essentially parallel to that of the outgoing signal from the laser diode. In another embodiment, which enhances coupling efficiency, a single element aspheric lens is positioned between the laser diode and the splitter. U.S. Patent No. 5,841,562 issued on November 24, 1998 to S. Rangwala, et al. describes a transceiver that comprises a transmitter module and a receiver-splitter module, which is plugged into a self-aligning socket of the transmitter module. U.S. Patent No. 6,075,635 issued on June 13, 2000 to T. Butrie et al. describes a bidirectional optical transceiver developed at Lucent Technologies Inc. that includes a housing in which a light source, lens, beam splitter, photodetector and an optical fiber are mounted. The lens focuses an outgoing optical signal from the source through the splitter to the end face of the fiber. The splitter directs an incoming optical signal to the photodetector. The fiber end face is beveled at an acute angle ϕ to

the normal to the common axis of the source, splitter and fiber, and the fiber is tilted at an acute angle θ to the same axis.

A disadvantage common to all four last-mentioned patents of Lucent Technologies Inc., as well to all preceding structures, is that the orthogonal geometry used in the bidirectional optical transceivers described in the aforementioned patents make it difficult to use such devices in high-speed systems with frequencies of 500 MHz or higher.

Very respectfully,
Applicants: _____
Encl.: PTO -1449 & References

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Sheet _____ of _____

FORM PTO-1449 (Substitute)	ATTY. DOCKET NO.	SERIAL NO.
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	FILING DATE	GROUP

JC979 U.S. PTO 10/074346 02/12/02

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA	4,592,619	1986	E. Weidel			
	AB	4,904,043	1990	R. Schweizer			
	AC	5,485,538	1996	T. Bowen et al.			
	AD	5,487,124	1996	T. Bowen et al.			
	AE	5,621,573	1997	W. Lewis, et al.			
	AF	5,796,899	1998	T. Butrie et al.			
	AG	5,838,859	1998	T. Butrie et al.			
	AH	5,841,562	1998	S. Rangwala, et al.			
	AI	6,075,635	2000	T. Butrie et al			
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

	AL						
	AM						
	AN						
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	AP						

OTHER PRIOR ART *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	AR						
	AS						
	AT						

EXAMINER	DATE CONSIDERED

*EXAMINER: *Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.*